



# Learning of Format of New Tooth Notation System – a Pilot Study

Ashfaq Akram<sup>1,2,\*</sup>, Maher Fuad<sup>2</sup>, Ulfat Bashir<sup>3</sup>, Thirupathi Vishnumukkala<sup>4</sup>, Melinda Madlena<sup>1</sup>

<sup>1</sup>Faculty of Dentistry, Semmelweis University, Budapest

<sup>2</sup>International Medical School, Management & Science University – Shah Alam

<sup>3</sup>Islamic International Dental College, Islamabad

<sup>4</sup>Perdana University, Serdang, Selangor

\*Corresponding author: ashfaqakram@hotmail.com

Received June 13, 2015; Revised June 22, 2015; Accepted July 02, 2015

**Abstract Background:** Universal system, Palmer notation and FDI system are used to record dental problems which give different numbers to same tooth. For example, central incisor is #8 (Universal system) and #11 (FDI system). Thus they create confusion in transferring dental information. A new tooth notation uses letters **I**-incisor, **C**-canine, **P**-premolar, **M**-molar (MICAP) and digits 1, 2, 3. The digits are printed as superscript and subscript on the relevant letters (I, C, P, M) to indicate the maxillary and mandibular teeth. **Aim:** to assess the learning of format of MICAP system by students of undergraduate dental degree and dental allied health programmes using a mock MICAP dental chart. **Materials and Methods:** A mock MICAP dental chart was prepared. Students of undergraduate dental degree [group A (n=39)] and dental allied health programme [group B (n=39)] who were further subdivided base on age such as [group 1=15-25 yrs, group 2=26-35 yrs, group 3=36-45 yrs], translated four MICAP symbols and vice versa in a cross sectional study after an hour lecture and video demonstration about the MICAP format. One way ANOVA and independent *t* test were performed to analyse the data. **Results:** Group A was better in translation of #<sup>1</sup>C (maxillary right canine) than group B [mean difference 95% CI: -0.128 (-0.285, 0.028) *p*=0.001]. In terms of age, group 1 was better in translation of MICAP format (*p*<0.001) as compared to other groups. Participants >50% agreed that MICAP notation system was easy to understand. **Conclusion:** Format of new notation is easy to learn. Teeth can be identified by new method. However, additional data is required before the reliability of the system is suggested as alternate dental charting system.

**Keywords:** permanent dentition, canine, dental charting, incisor, mock, molar, premolar

**Cite This Article:** Ashfaq Akram, Maher Fuad, Ulfat Bashir, Thirupathi Vishnumukkala, and Melinda Madlena, "Learning of Format of New Tooth Notation System – a Pilot Study." *International Journal of Dental Sciences and Research*, vol. 3, no. 4 (2015): 92-95. doi: 10.12691/ijdsr-3-4-3.

## 1. Introduction

Dental charting is proceeded by one of the three commonly used tooth notation systems. FDI notation identifies upper right and upper left teeth by numbers '11-18 & 21-28' respectively. Lower left and lower right teeth are marked by '31-38 & 41-48' respectively [1]. Palmer notation indicates the permanent teeth by 1 to 8 Arabic numbers with a special grid [2]. According to Universal system, teeth are numbered from 1-32 starting from upper right 3<sup>rd</sup> molar to lower left 3<sup>rd</sup> molar in a clock wise direction [3].

In current practice trend, sharing dental information is common and beneficial for better dental care of the patients. The most dental curricula have included teaching modules on communication skills because poor communication plays a significant role in dissatisfaction of dental care and results in termination of the clinician – patient relationship [4]. Study showed dentists were 0.9 percent of the total malpractice cases in Turkey [5].

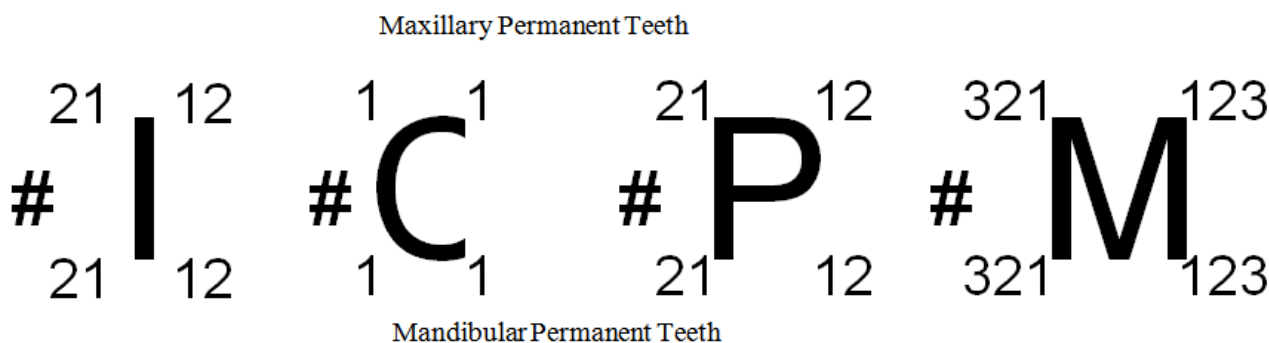
The current notation systems are based on Arabic numbers and give different numbers to a particular tooth. For example, maxillary right lateral incisor is #12 (FDI system) and #7 (Universal System). Considering a referral note of FDI system, upper right first molar is #16 and same tooth is #6 when Palmer notation is employed. Having a single recommended notation by all is a dilemma.

A couple of years ago, a tooth notation system was proposed. According to new notation, letters **I**-incisor, **C**-canine, **P**-premolar, **M**-molar (MICAP) represent the four tooth classes [6]. The tooth types of each tooth class are marked by digits (1, 2, 3) which are written as superscript and subscript on relevant letters (I,C,P,M) to represent the upper and lower teeth as shown in Figure 1 [7].

The present study is a step towards learning of its format by prospective users which could be an alternate dental charting method. The learning of new system by students of undergraduate dental degree and dental allied health programme was focused because they learn and practice currently used tooth notation as part of their clinical skill training. MICAP notation is a new notation

which is neither taught in any dental curriculum nor practiced in anywhere. This pilot study aimed to assess the learning of format of new notation (MICAP) by dental

students. The study was approved by ethics committee of faculty of dentistry, Semmelweis University -Budapest.



**Figure 1.** The letters (I, C, P, M) and digits (1, 2, 3) represent the tooth classes and their types respectively. The digits (1,2,3) are printed as superscript and subscript and right and left side of each relevant letter to indicate the teeth of maxillary and mandibular of right and left quadrants. For example #<sup>123</sup>M<sub>123</sub>, digits 123 represent 1-first molar, 2- second molar, 3- third molar and letter M indicates the tooth class 'molar'. The superscripted and subscripted digits (123) mean upper and lower first, second, third molars respectively. The digits 123 are read separately as first, second and third molar instead of 321 (three twenty one) or 123(one twenty three) [7]

## 2. Material and Methods

For an observational –cross sectional study design, convenience study samples were group A [students of undergraduate dental degree programme n=39] and group B [students of dental allied health programme n=39]. Group A was selected from bachelor of dental surgery programme from a private dental college in Selangor and group B was chosen from a dental allied health programme (dental assisting, hygienists, dental technology) from Islamabad. All participants were further subdivided base on age factor; group 1=15-25 yrs, group 2=26-35 yrs, group 3=36-45 yrs. Study objectives were explained and written consents were obtained before the procedure was carried out. All participants were explained the new system by lecture followed by short video.

Mock dental chart based on MICAP notation system was the instrument. The primary focus was to assess the understanding of the new tooth notation system especially its format for identification of teeth. Therefore the design and other feature of a standard dental chart were ignored.

Eight permanent teeth were randomly selected which were further stratified into two categories. Four teeth described in *word form* were to be written in MICAP format and four teeth presented in *MICAP format* were to be translated into word form. The teeth described in word form were 'Maxillary right central Incisor, Mandibular left 2<sup>nd</sup> Premolar, Maxillary left Canine, Mandibular right 2<sup>nd</sup> Molar' and teeth presented in MICAP format were [#<sup>1</sup>C #C<sub>1</sub> #<sup>2</sup>P #<sub>1</sub>P].

In addition, a closed end questionnaire based on five point likert scale (1= strongly disagree, 2=disagree, 3= neutral, 4= agree, 5=strongly agree) was included to obtain the perception on the conceptual framework and the prospective suitability of the new tooth notation system in dental charting procedure. An hour lecture and a short video demonstration of the new tooth notation system were provided *once* before collecting data from the study participants. The mock charting forms were collected from September 2014 to November 2014.

## 3. Data Analysis

One -way analysis of variance (ANOVA) and independent *t* test were performed by SPSS version 20 to analyse the data. Statistical *p* value was <0.05.

## 4. Results

Based on gender and age group, the frequency and percentage of participants were male (n= 32, 41%) & female (n= 46, 59%), while group 1 (n=47, 60.3%) group 2 (n=27, 34.5%) and group 3 (n=4, 5.1%). Other demographic characteristic are shown in [Table 1](#).

**Table 1. Demographic characteristics of study population (n =78)**

Variable	Category	n	Percent
Gender	Male	32	41
	Female	46	59
Age group	15-25 yrs	47	60.3
	26-35 yrs	27	34.6
	36-45 yrs	04	5.1
Study population	Dental students	39	50
	Dental allied health students	35	44.8
	Dental allied health personals	4	5.2

Translation and write up of MICAP format were assessed and shown in [Table 2](#). Group A translated MICAP format and mirrored it back significantly better than group B. For example, #<sup>1</sup>C was translated correctly as 'Maxillary right canine' [(X (SD): 0.79 (0.41); Mean difference, 95% CI; -0.128 (-0.285, 0.028) *p* <0.001)]. Similarly the descriptive form of tooth such as 'Mandibular right 2<sup>nd</sup> molar' was correctly recorded in MICAP format #<sub>2</sub>M [X (SD):0.85 (0.36); Mean difference, 95% CI: 0.282 (0.083, 0.480), *p* <0.000)].

**Table 2. Mean comparison of two groups (students of undergraduate dental degree & dental allied health programme) on understanding of new tooth notation (MICAP)**

Element	Tooth Classes / Types to be assessed	Correct Translation/ Conversion *	Undergraduate dental students (n =39 ) X(SD)	Dental allied health students (n =39) X(SD)	t (df)	Mean difference 95% (C.I)	P value
Translation of MICAP format	# <sup>1</sup> C→	Maxillary right Canine	0.79 (0.41)	0.92 (0.27)	-1.63(65.82)	-0.128 (-0.285, 0.028)	0.001
	#C <sub>1</sub> →	Mandibular left Canine	0.82 (0.39)	0.89 (0.31)	- 0.97 (76)	-0.077 (-0.234,0.081)	0.052
	# <sup>2</sup> P→	Maxillary right 2 <sup>nd</sup> Premolar	1.00 (0.00)	0.79 (0.41)	3.13 (38.0)	0.205 (0.072,0.337)	0.000
	# <sub>1</sub> P→	Mandibular right 1 <sup>st</sup> Premolar	1.00 (0.00)	0.71(0.45)	3.86 (38.0)	0.282 (0.134, 0.429)	0.000
Conversion into MICAP format	Maxillary right central Incisor	# <sup>1</sup> I	0.89 (0.31)	0.82 (0.39)	0.97 (76)	0.077 (-0.081, 0.234)	0.052
	Mandibular left 2 <sup>nd</sup> Premolar	# P <sub>2</sub>	0.95 (0.22)	0.69 (0.47)	3.09 (54.45)	0.256 (0.090, 0.422)	0.000
	Maxillary left Canine	# C <sup>1</sup>	1.00 (0.00)	0.77 (0.43)	3.38 (38.0)	0.231 (0.092, 0.369)	0.000
	Mandibular right 2 <sup>nd</sup> Molar	# <sub>2</sub> M	0.85(0.36)	0.56 (0.50)	2.83 (69.42)	0.282 (0.083, 0.480)	0.000

Independent t test \*Correct translation & conversion show better understanding of MICAP notation system.

Post hoc multiple comparisons (Table 3) shows the group 1 to convert the descriptive form of teeth to MICAP format was significantly better than remaining two groups (2& 3) [X (SD): 3.6 (0.64), f (df): 9.56(2, 75), P <0.001].

**Table 3. Analysis of Variance to compare the knowledge of MICAP tooth notation in three age groups: Group A (n=47),Group B (n=27), Group C (n=4).**

Variable	Age group			f ( df)	P value
	Group A (15-25yrs) (n) = x (SD)	Group B (26-35 yrs) (n) = x (SD)	Group C (36-45 yrs) (n) = x (SD)		
Translation of MICAP format into word form	(47) 3.5 (0.90)	(27) 3.4 (0.84)	(4) 2.0 (1.41)	5.67 (2,75)	<0.005*
Conversion from word form into MICAP format	(47) 3.6 (0.64)	(27) 2.7 (1.26)	(4) 2.7 (0.96)	9.56 (2,75)	<0.001 **

\* Bonferroni –Post hoc

\*\*Tamhane - Post hoc

Post hoc multiple comparisons indicate that age group A (15-25 yrs) was significantly better in translation of MICAP format (p<0.005) as well as write up (conversion) into MICAP format (p<0.001) as compared to age group B (26-35) & C (36-45). However, sample size of age group B & C were very small.

The descriptive statistics showed that more than fifty percent (n =42, 53.8%) agreed that MICAP notation was easy to understand. Similarly majority of participants (n=45, 57.7%) were able to write MICAP format. In contrast, very small number of participants (n=2, 2.6%)

rejected the role of MICAP in dental charting and communication of dental information. In addition, one fourth participants (≤ 25%) were not sure about prospective role of MICAP in dental charting as well as communication source of dental information (Table 4).

**Table 4. Perception of undergraduate students and dental allied health personals (n=78) on MICAP format and its possible application in dental charting and communication of dental information**

Statement	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)
Format of MICAP is understandable	2 (2.6)	8 (10.3)	20 (25.6)	42 (53.8)	6 (7.7)
Ability to write teeth name in MICAP format	1 (1.3)	5 (6.4)	20 (25.6)	45 (57.7)	7 (9.0)
Dental charting is possible by MICAP system	2 (2.6)	13 (16.7)	22 (28.2)	36 (46.2)	5 (6.4)
Referral letter can be written by MICAP system	2 (2.6)	9 (11.5)	20 (25.6)	38 (48.7)	9 (11.5)

Five point likert scale shows more than fifty percent participants were able to understand and write teeth in new tooth notation (MICAP) system.

**Table 5. Comparison of FDI, Universal and MICAP system for teeth identification**

MICAP system	FDI system	Common Digits	Universal system	MICAP system
# <sup>1</sup> I	Maxillary right central incisor	#11	Maxillary left canine	# C <sup>1</sup>
# <sup>1</sup> P	Maxillary right first premolar	#14	Maxillary left first molar	# M <sup>1</sup>
# C <sup>1</sup>	Maxillary left canine	#23	Mandibular left lateral incisor	#I <sub>2</sub>
#P <sup>1</sup>	Maxillary left first premolar	#24	Mandibular left central incisor	#I <sub>1</sub>
#I <sub>1</sub>	Mandibular left central incisor	#31	Mandibular right second molar	# <sub>2</sub> M
#I <sub>2</sub>	Mandibular left lateral incisor	#32	Mandibular right third molar	# <sub>3</sub> M

For different teeth, same number or vice versa may complicate the clinical scenario. The digits 11-18, 21-28, 31,32 are common between FDI and Universal. If we add Palmer notation' digits (1-8), the clinical situation become more confusing. Comparing FDI and Universal system #32 is Mandibular left lateral incisor (FDI) and Mandibular right third molar (Universal). But considering MICAP system, #I<sub>2</sub> and #<sub>3</sub>M represent the two teeth respectively. The letter **I** and **M** represent Incisor and Molar and provide clear identification or differentiation between the two tooth classes.

## 5. Discussion

Multiple tooth notations are used to record the dental problems in different parts of the world. Researchers have pointed out that specialists and general dentists use different systems for dental communication [8,9]. In UK, most of the dentists use Palmer notation [10]. But FDI system is also recommended [11]. In US, Universal numbering is the standard for dental charting especially by oral surgeons [12]. In past, Palmer notation and FDI system were combined to make a global system. Thus letters such as UR for upper right, UL for upper left, LL for lower left and LR for lower right were suggested to replace the Zsigmondy grid. Maxillary left 2<sup>nd</sup> molar was written as UL7 [27] where UL 7 showed the Palmer and [27] indicated the FDI system [13]. Multiple teeth were a greater problem for new combined method. In contrast to the combination of FDI and Palmer system, MICAP system marks the teeth by letters (I for incisor, C for canine, P for premolar and M for molar) which are standard terminologies and used in dentistry globally.

The second aspect is how to represent upper and lower teeth and differentiate within one tooth class (e.g., 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> molar). The numbers 1, 2, 3 are printed along letter M as superscript and subscript to represent upper and lower molars respectively. Writing digits as superscript and subscript is a simple procedure. This is evidence by our results where majority of study participants wrote correctly the MICAP format.

We observed that teen age population (15-25 yrs) learnt the new system quicker than mature personals. In our pilot study, sample size was quite low of mature population. From statistics point of view this is a limitation of the study but it gave a clue the learning of new system is faster by young generation. The studies confirm that young learners are fast learner [14,15]. This indicates, even sample size is small, if this system is applied in dental schools, students would learn the format and be able to apply in their practice.

We agree the FDI notation system differentiates between right and left sides as well as upper and lower dental arches [16]. But it is quite possible once dental information is shared between two or more than two dental offices / institutes and they are using different tooth notations. There could be a confusing situation. For example #32 is Mandibular left lateral incisor in FDI system and Mandibular right third molar in Universal system. But considering MICAP system, #I<sub>2</sub> and #<sub>3</sub>M represent the two teeth respectively. The letter **I** and **M** represent Incisor and Molar and provide clear identification or differentiation between the two tooth classes.

FDI is the preferred tooth notation. We are neither against FDI system nor Universal system. We are proposing a new system for dental examination. It has been observed that Universal system is commonly practised in US & Canada. FDI is used in Europe. In many Asian countries, Palmer notation is a preferred notation method. There are prone and cones of each system but each country or region have adopted a particular system. As a new knowledge, MICAP fulfils the identification of teeth regardless this system is implemented in dental practice or not (Figure 1).

## 6. Conclusion

The results of pilot study support the learning of format of new notation which is simple to write and translate. For example, Maxillary right central Incisor is marked as #<sup>1</sup>I. Similarly #<sub>1</sub>P is translated as Mandibular right 1<sup>st</sup> Premolar. However, the results must be obtained on a large scale to test the reliability of the system.

## Acknowledgement

Authors would like to thank web designing department of Advanced Medical and Dental Institute, Universiti Sains Malaysia for providing free video on MICAP system.

## Further Study

MICAP system may be tested by e-dental charting from the aspect of 'computer friendly'.

## Conflict of Interest

Authors declare there was no conflict of interest in this study.

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